

In the Title:

Please delete the title and replace with -- DYNAMIC COMPUTATION OF A LINE SEGMENT ARRANGEMENT USING FINITE PRECISION ARITHMETIC FOR USE IN A PROCESSORCONTROLLED SYSTEM--

In the Claims:

Sub D¹ (Amended) [A method for operating a processor-controlled machine to dynamically produce an output partition data structure indicating a partition of a plane induced by an input unrounded line segment; the input unrounded line segment being represented by a set of real coordinates in the plane; the output partition data structure indicating an output rounded line segment representing the input line segment by a set of finite precision coordinates; the method comprising:]

C¹ For a processor-controlled system capable of operating on and displaying arrangements of line segments in a plane, a method for dynamically producing an output partition data structure representing said arrangement of line segments, said output partition data structure induced by an input unrounded line segment; the input unrounded line segment being represented by a set of real coordinates in the plane; the output partition data structure indicating an output rounded line segment representing the input line segment by a set of finite precision coordinates; the method comprising:

receiving data indicating the an input unrounded line segment and a signal to insert the unrounded input line segment into an input partition data structure indicating a first partition of the plane;

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accessing the input partition data structure; the input partition data structure including data indicating a prior set of unrounded line segments; the prior set of unrounded line segments including a boundary set of unrounded line segments forming a rectangular boundary lying on the plane; locations in the input partition data structure being capable of being specified with reference to a finite precision grid of tiles superimposed on the plane; each tile having a position included therein referred to as an integral point having finite precision coordinates; the input unrounded line segment having real coordinates specifying a position within the rectangular boundary;

determining a plurality of tiles in the finite precision grid related to the input unrounded line segment using the prior set of unrounded line segments; the plurality of tiles in the finite precision grid related to the input unrounded line segment being hereafter referred to as a plurality of

related hot pixels; each related hot pixel including an endpoint of the input unrounded line segment or at least one point on an unrounded line segment included in the input partition data structure;

for each related hot pixel. performing a rounding operation using the input unrounded line segment; the rounding operation replacing real coordinates of a nonintegral point on an unrounded line segment located within the boundary of the related hot pixel with the finite precision coordinates of the integral point of the related hot pixel; the rounding operation causing an unrounded line segment to be split into two fragment line segments, each referred to individually as a fragment and collectively as a polysegment, having a vertex at the integral point in the related hot pixel; each fragment

produced by the rounding operation being referred to as belonging to the unrounded line segment from which it was produced;

adding the fragments of the polysegment to the input partition data structure to produce an updated output partition data structure; and

storing the input unrounded line segment in the output partition data structure; the input unrounded line segment being associated in the output partition data structure with all of the fragments belonging to the unrounded line segment from which it was produced.

2.(Amended) The method of claim 1 for operating a processor-controlled machine to dynamically produce an output partition data structure further including

receiving a second input unrounded line segment and a signal to delete the second unrounded input line segment from the input partition data structure;

determining at least one fragment belonging to the input unrounded line segment; and

deleting the determined at least one fragment belonging to the input unrounded line segment from the input partition data structure to produce the updated output partition data structure.

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C 8.(Amended) The method of claim 1 for operating a processor-controlled machine to dynamically produce an output partition data structure wherein all regions in the plane indicated by the input and output partition data structures include subregions referred to as cells; the cells having a standardized geometric shape having a fixed number of bounded sides; the method further including, when adding the determined at least one fragment representing the unrounded line segment to the input partition data structure produces a region in the plane having a shape different from the standardized geometric shape, adding line segments referred to as attachments to the input partition data structure to produce at least one cell having a standardized geometric shape.

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C 13.(Amended) An article of manufacture for use by a processor-controlled [machine for dynamically producing a partition data structure indicating a partition of a plane induced by an input unrounded line segment;] system capable of operating on and displaying arrangements of line segments in a plane, the [machine] system including input signal circuitry for receiving input signals; storage medium access circuitry for accessing a medium that stores data; a memory device for storing a partition data structure representing an arrangement of line segments in a plane; and a processor connected for receiving the input signals from the input signal circuitry, connected for accessing the partition data structure stored in the memory device, and connected for receiving data from the storage medium access circuitry; the article comprising:

a data storage medium that can be accessed by the storage medium access circuitry when the article is used by the machine; and

data stored in the data storage medium so that the storage medium access circuitry can provide the stored data to the processor when

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the article is used by the machine; the stored data comprising instruction data indicating instructions the processor can execute[;], said instruction data including instructions for:

[the processor, in executing the instructions,] receiving data from the input signal circuitry indicating an input unrounded line segment and a signal to insert the unrounded input line segment into a partition data structure indicating a first partition of the plane; the input unrounded line segment being represented by a set of real coordinates in the plane;

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C [the processor, further in executing the instructions,] accessing the partition data structure; the partition data structure including data indicating a prior set of unrounded line segments including a boundary set of unrounded line segments forming a rectangular boundary lying on the plane; locations in the partition data structure being capable of being specified with reference to a finite precision grid of tiles superimposed on the plane; each tile having a position included therein referred to as an integral point having finite precision coordinates; the set of real coordinates of the input unrounded line segment specifying a position within the rectangular boundary;

[the processor, further in executing the instructions,]determining a plurality of tiles in the finite precision grid related to the input unrounded line segment using the prior set of unrounded line segments; the plurality of tiles in the finite precision grid related to the input unrounded line segment being hereafter referred to as a plurality of related hot pixels; each related hot pixel including an

endpoint of the input unrounded line segment or at least one point on an unrounded line segment included in the partition data structure;

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C [the processor, still further in executing the instructions,] performing, for each related hot pixel, a rounding operation using the input unrounded line segment; the rounding operation replacing real coordinates of a nonintegral point on an unrounded line segment located within the boundary of the related hot pixel with the finite precision coordinates of the integral point of the related hot pixel; the rounding operation causing an unrounded line segment to be split into two fragment line segments, each referred to individually as a fragment and collectively as a polysegment, having a vertex at the integral point in the related hot pixel; each fragment produced by the rounding operation being referred to as belonging to the unrounded line segment from which it was produced;

[the processor, still further in executing the instructions,] adding the fragments of the polysegment to the partition data structure to produce a modified partition data structure;

[the processor, further in executing the instructions,] storing the input unrounded line segment in the modified partition data structure; the input unrounded line segment being associated in the modified partition data structure with all of the fragments belonging to the unrounded line segment from which it was produced.

14. (Amended) The article of manufacture of claim 13 wherein all regions in the plane indicated by the partition data structure include subregions referred to as cells; each cell having a standardized geometric shape having a fixed number of bounded

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sides; and wherein, when a region in the plane having a shape different from the standardized geometric shape is produced as a result of the processor adding the at least one fragment representing the unrounded line segment to the modified partition data structure, [the processor, further in executing the instructions, adds] said instruction data further including instructions for adding line segments referred to as attachments to the modified partition data structure to produce at least one cell having a standardized geometric shape.

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C 15. (Amended) The article of manufacture of claim 13 wherein replacing the real coordinates of a nonintegral point on an unrounded line segment with the finite precision coordinates of the integral point of the related hot pixel is referred to as perturbing the unrounded line segment to the integral point of a related hot pixel; and [wherein the processor, in performing the rounding operation,] said instruction data further including instructions for

[perturbs] perturbing an endpoint of the input unrounded line segment located within the boundary of a related hot pixel to the integral point of the related hot pixel; and

[perturbs] perturbing an intersection point of the input unrounded line segment with an unrounded line segment included in the prior set of unrounded line segments located within the boundary of a related hot pixel to the integral point of the related hot pixel.

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